annual report

1980

Saskatchewan **Research**
Council

THE RESEARCH COUNCIL ACT, 1965.
Clause 21, in part, directs that:

1. The Council shall on or before the last day of February in each year submit to the Lieutenant Governor in Council a report of its proceedings and transactions during the next preceding calendar year, which report shall contain such particulars as the Lieutenant Governor in Council may prescribe.

2. Every report shall forthwith be laid before the Legislative Assembly if then in session of, if it is not in session, within fifteen days after the opening of the next session.

Regina, February 25, 1981

●

TO THE HONOURABLE C. McINTOSH

Lieutenant Governor of the
Province of Saskatchewan

MAY IT PLEASE YOUR HONOUR:

The undersigned presents herewith, for your consideration, the report of the Saskatchewan Research Council for the year ended December 31, 1980.

Respectfully submitted,

Norman Vickar, Chairman
Saskatchewan Research Council

PLEASE ADDRESS CORRESPONDENCE TO:

Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

101-07598/

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MEMBERS OF THE SASKATCHEWAN RESEARCH COUNCIL

The Honourable Norman Vickar, Chairman
G. L. Gartner, Vice Chairman
C. Bryant, Executive Secretary to Council
D. Murray, Secretary
G. Birney
T. S. Burton
E. B. Campbell
N. Carter
B. M. Craig
W. Degelman
L. Katz
K. J. McCallum
P. Melin
B. Michel
P. Nikiforuk
J. Perkins
J. Sinclair
B. Thompson
E. B. Tinker

EXECUTIVE OFFICERS OF THE COUNCIL S STAFF

Executive Director ..... T. P. Pepper
Administrative Officer ..... R. E. Melvin
Director of Financial Services ..... R. McGrath

Division Heads
Chemistry and Biology ..... E. M. Coxworth
Engineering ..... W. H. W. Husband
Geology ..... R. G. Arnold
Industrial Services ..... A. Scharf
Physics ..... J. Maybank

PROCEEDINGS OF THE COUNCIL

Membership of the Council remained at 18, the maximum number permitted by the Saskatchewan Research Council Act.

J. Hutch, G. C. Mitchell, M. Wallace and J. O. Jonsson left Council during the year. Council extends grateful thanks to these gentlemen for the contribution to Council activities. New members appointed included N. Carter, W. Degelman, J. Perkins and J. Sinclair.

Council met three times during 1980: in Regina on January 28th, in Saskatoon on May 27th, and in Regina on December 4th, 1980. The main business of these meetings was to receive the reports of the Executive Committee and the Executive Director, to formulate policy and priorities for the program of the laboratories, and, in particular, to consider the future role of the Saskatchewan Research Council. In this last capacity Council received the report of the Ad Hoc Committee on the Future Role of the Saskatchewan Research Council and immediately initiated two actions. It directed SRC management to bring in a long range plan for the Council's operations. Also, it acquired Carole Bryant, a Corporate Secretary of Crown Investments Corporation, as Executive Secretary to Council.

The Executive Committee, consisting of Council Chairman, Vice Chairman, Secretary, Dr. B. Craig, Dr. L. Katz, with the Executive Director as secretary, met four times; January 18th, May 21st, September 2nd, and November 25th, 1980. The main activities of the Executive Committee were, in collaboration with Council management, to prepare policy and major administrative program items for Council discussion.

PROGRAM OF THE COUNCIL'S STAFF

INTRODUCTION

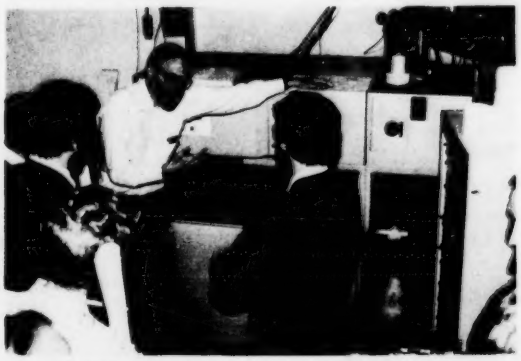
Russell W. Peterson, writing in the American Scientist asserts "Nothing has had more impact on the quality of life than the application of science — both positively and negatively. The obvious challenge is to apply our scientific knowledge in ways that will maximize the positive and minimize the negative."

As we end the first year of the 1980's we see unmistakable signs that both the provincial and federal governments have acknowledged this fact. The challenge of the Saskatchewan Research Council is to make sure that we do "maximize the positive and minimize the negative" aspects of applied science. For us at SRC I believe this can be encapsulated in TIE, *Technology Implemented Effectively,* for our overall welfare. We must try to make sure that research and development leads to implementation. We must equally try to see that implementation is useful and effective.

In 1980-81 we expect a good year. The government grant increased by five percent over 1979-80 to $2,728,000, and the revenue from fee-for-service work is expected to increase by at least 27% to over $4,000,000. The number of paying clients is expected to increase to over 250.

While we are increasingly aware of the need for industrialization, especially for high technology industrialization, for job creation and economic stabilization, we in Saskatchewan must remain acutely responsive to the technological needs of our developing and potentially immense resource industries. Our Resources Research Facility, in the SEDCO Industrial Research Park, has been completed and is operational. The general purpose pilot plant is presently fully dedicated, under contract to AMOK Limited, to the processing of its uranium ore. The larger pilot plant, likewise, is fully dedicated by a renewable long-term lease, to the Potash Corporation of Saskatchewan for its R & D program. The third component of the Resources Research Facility now houses SRC's chemical and radiation analytical services. With the installation early in 1981 of a Slowpoke Reactor for neutron activation analysis this facility will become one of the most versatile analytical facilities in Canada. It is appropriately equipped to serve the growing needs of Saskatchewan's expanding resource and energy industries.

Many other activities have progressed well during the year. We have added to services available to clients new service facilities for Saskatoon's small but promising electronics industry and a uranium detector-calibration service to Saskatchewan's not-so-small but equally promising uranium industry. Our slurry



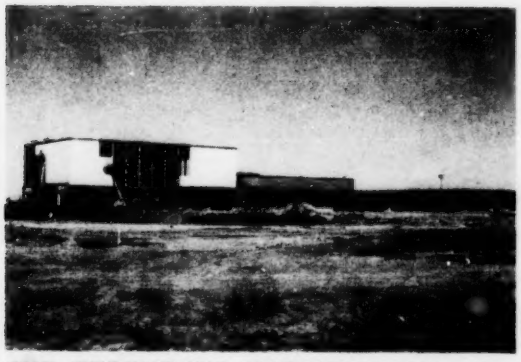
NORTHWEST REGIONAL ECONOMIC DEVELOPMENT COUNCIL, a group from rural and urban municipal governments in northwestern Saskatchewan, toured SRC to familiarize themselves with the Council's capabilities. Here council members examine SRC's new plasma spectrometer being demonstrated by Ewen Coxworth.

pipeline facility has achieved world-wide recognition and an increasing popularity with clients seeking service. SRC staff have played significant roles in establishing Saskatchewan's leading-edge position in residential energy conservation technology and utilization of biomass. We see our biomass program evolving into a practical and essential aspect of a major biotechnology program which we wish to support and hope will develop in Saskatchewan.

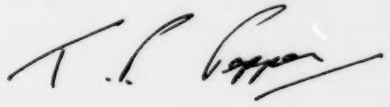
Staff have responded magnificently to Council's request at its 103rd meeting that we develop a long range plan for our operations. A planning directorate has selected senior staff to chair ten task forces, on which sit some 50 SRC staff and some ten outside experts, charged with looking into activities considered of prime importance to Saskatchewan. Another 200 or more experts and concerned technical people have been interviewed for opinions and recommendations. A long range plan is scheduled for completion by mid 1981.

Full time staff increased by about 30 to just over 200, with a maximum at the height of a summer field season of approximately 240. The increase was almost wholly of technical staff to undertake the increased analytical services in the Chemistry and Geology Divisions.

As of April 1, 1980, the Saskatchewan Department of Government Services assumed responsibility for our space needs. That department will be providing us with 17,000 square feet of leased space in the SEDCO Centre Building in the Saskatoon Research Park into which, early in 1981, we will accommodate all of the staff of the Division of Industrial Services, selected activities of the Divisions of Chemistry and Biology, and of Physics — some 50 staff in total. Additionally, some 30 staff from the Divisions of Chemistry and Biology and of Engineering are now accommodated in the Resources Research Facility. These moves have greatly eased the congestion but have fractionated staff space-wise into six locations. For overall effectiveness of operations we therefore continue to press for appropriate permanent quarters near the Resources Research Facility in the Saskatcon Research Park. It is a pleasure to acknowledge with gratitude the forebearance of staff to difficult working conditions and their co-operation and yeoman performance during this year, especially under the added challenge of preparing the Long Range Plan.



THE RESOURCES RESEARCH FACILITY, SRC's new multimillion dollar pilot plant and analytical services complex in the Saskatoon Research Park, is shown nearing completion. The section still under construction (left) is the 40-foot ceiling potash pilot plant under lease to the Potash Corporation of Saskatchewan. Other facilities housed here include the general purpose pilot plant and the analytical laboratory which will also contain the Slowpoke Reactor.



AGRICULTURE AND AGRICULTURAL PROCESSING

INTRODUCTION

Saskatchewan, with almost 50 per cent of Canada's developed farm land, bears a heavy burden of leadership in the research and development of agriculture and agricultural processing programs.

The Saskatchewan Research Council has devoted considerable effort, in co-operation with federal and provincial governments, universities, farmers and the business community, towards the improvement of agricultural practices, reduction of agricultural energy consumption, provision of agricultural water supplies, protection of the agricultural environment and the development of new economic uses of agricultural products.

WHOLE PLANT OILS FROM SASKATCHEWAN PLANTS

The developing world petroleum situation has focused attention on alternative sources of energy, including biomass. Present fossil fuels are derived from plants which lived millions of years ago. If the overall process can be speeded up, existing green plants would become an energy source.

This may be viewed as the development of "petroleum plantation" agriculture, where reduced, photosynthetic plant products are utilized immediately as substitutes for materials presently derived from fossil crude oil. In addition, unlike gasohol where potential food crops are converted into fuel alcohol, many of these "gasoline plants" can be grown on marginal and non-productive land.

Milkweed, a hardy perennial plant found in south-central Saskatchewan, is under consideration due to the milky latex present inside the stems and the leaves of the plant which contain a high concentration of readily extractable, refinable hydrocarbon material having an energy potential comparable to fossil crude oil. The program has also examined the residual "crude oil" extracted biomass, which shows considerable potential as animal feed-stock or as a substitute for fuel alcohol production.

There is some field evidence that milkweed may tolerate saline soils. If confirmed, this would be a valuable characteristic of this potential crop. Initial field experiments to test this have begun in conjunction with the Swift Current CDA station. The University of Saskatchewan has provided land for non-saline field tests and the program is funded by Canadian and Saskatchewan interests.

IMPROVING THE FEED VALUE OF CROP RESIDUES AND FORAGES

The vulnerability of the cattle industry in Saskatchewan to drought conditions, which restrict conventional pasture and hay supplies, was dramatically demonstrated in 1980. An SRC program, operated jointly with Agriculture Canada and the University of Saskatchewan, is investigating biological, agronomic and chemical methods of improving the feed value of crop residue and forage, in order to develop simple techniques to alleviate such emergencies. Straw and chaff, in themselves, are not very good feeds, but can be enriched through ammoniation to provide a larger fraction of an animal's feed supply. SRC's five-year study of ammonia treatment of straw has now defined conditions required for a significant improvement in feed value, in a farm environment. A dozen farm demonstrations were conducted under contract with the Saskatchewan Department of Agriculture and animal performance will be assessed over this winter. Based on sheep

feeding, treated chaff outperformed treated straw in trials at the Swift Current CDA station.

Equal emphasis is being placed on non-chemical methods of improving the feed value of crop residues. As well, investigation of the effect of fertilization (both manure and commercial types) on straw feed value showed that nitrogen fertilizer significantly increased the crude protein content, while digestibility increased slightly. Sizeable differences were noted in the feed value of the straws of various wheat cultivars. Pitic 62 showed the highest value.

Sunflower crop residues (heads and upper stems) continue to show high feed values, but the extent of sunflower acreage limits this source.

STRAW AMMONIATION, to improve the feed value of crop residues, was the subject of this demonstration at the farm of Robert Martin, near Aberdeen, Sask. This was one of a dozen demonstrations put on jointly by the Saskatchewan Department of Agriculture and the SRC to show methodology of processing wheat straw with anhydrous ammonia.

ENERGY CONSERVATION CROPPING PRACTICES

There is great concern on the part of both farmers and agricultural scientists about the high energy dependency of Saskatchewan agriculture. This concern centres on fuel and fertilizer costs, the major inputs into provincial farming. Cropping practices which will save energy without reducing yields are a safeguard against energy costs rising at a faster rate than grain prices.

Three potential energy saving practices have been studied by SRC scientists. The first is snow management, to trap more snow on the fields in order to provide more moisture and resulting higher yields for the same investment of fuel and fertilizer. Leaving tall stubble stands or grass barriers to trap more snow are two accepted practices. Winter wheat has shown good response as well, with from 34 to 44% net energy savings.

Legumes, grown in rotation with normal crops, reduce the requirement for nitrogen fertilizers, as nitrogen is fixed from the air by the legume. Tests done at the CDA station at Indian Head, using sweet clover as green manure, produced yields similar to those gained from regular application of commercial nitrogen-phosphorus fertilizer, with less energy expenditure. Studies are now underway to assess the combination of snow management with legume rotation, to compensate for the moisture depletion in growing the legume.

Zero tillage is not a new concept to prairie farmers. However, it can be shown that the reduction or elimination of conventional tillage operations and the use of only herbicides to control weeds, is fuel efficient. The cost of the herbicides is considerably less than the cost of the fuel saved.

Results of experiments conducted at Lethbridge have been recalculated to Saskatchewan practices and it is believed that up to 48% net saving can be achieved by the increased use of herbicides.

Another study in conjunction with the University of Saskatchewan is being conducted to test the theory that chaff collection reduces weed populations and, hence, herbicide costs. A useful spin-off may be the feed value of the chaff and its possible usage as a raw material for fuel production, such as ethanol.

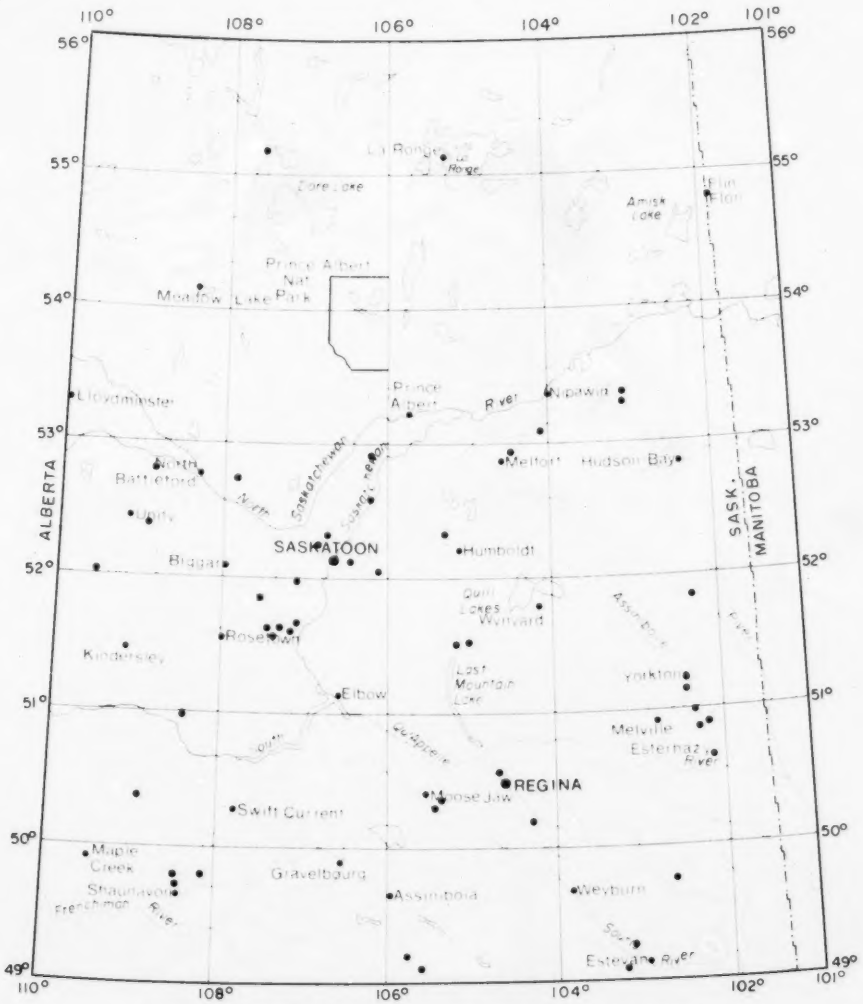
THE AGRICULTURAL ENVIRONMENT

Pesticide Exposure

To investigate various factors affecting worker exposure to pesticide spray, a series of field measurements were conducted with a crew of custom aerial applicators on brush spraying at a community pasture in co-operation with the University of Saskatchewan's Social and Prevention Medicine Department and Agriculture Canada Research Station. The skin exposure varied on regions of the worker's body by a factor of 100. The penetration of herbicide through the work clothing was found to be approximately 1/10 the value on exposed skin. The respiratory exposure from the spray operation was found to be minimal. Results produced will help Health and Welfare Canada refine existing control methods of occupational exposure to pesticides.

Grain Dust

Results of a two-year survey on grain dust in the working environment of country elevators were compiled. This is a part of collaborative study on grain dust and health with the Division of Pulmonary Medicine of the University of Saskatchewan and the grain industry. Further studies are in progress to produce data to correlate worker exposure to dust with the working capacity of elevators. This information is vital in the assessment of health effect by the medical team.



Location of SRC elevator grain dust sampling sites

Animal Confinement

The difference of air quality in a riding stable between winter and summer seasons was studied by conducting sequential samplings of airborne dust. Results indicated that the prolonged presence of fine dust is one of the characteristics in the winter period. This kind of dust is strongly suspected to act as a transport medium of micro-organisms or bacteria that could cause health hazards for horses.

The circulation of air inside a turkey barn was studied to develop an ideal system of dust control and to provide a healthier environment during tom production period. A compromise between air quality control and energy saving practice is being sought by computer modeling of an air exchange system in the barn. Thus, the increased production of turkey with quality control may be achieved by growers in the province.

AGRIBUSINESS VALUE-ADDED DEVELOPMENT

The objective of the program is to foster increased value-added and maximized utilization of agricultural products produced in the province. Over the last year the program has concentrated on two major areas:

— fibre crops

— alternative energy sources

The four projects undertaken involved over $200,000 obtained in federal funding for both inhouse work and subcontracts to other organizations on the University of Saskatchewan campus. Multiorganization projects are essential to cover the wide range of disciplines required in agricultural processing. A good example is the study to determine the technical feasibility of using rapeseed oil in diesel engines. This $66,000 contract with Agriculture Canada is being managed by SRC with involvement of the POS Pilot Plant Corp. and the University of Saskatchewan.

Benefits of the program, as with most long term projects, are difficult to determine on a yearly basis. However, the seed flax fibre project has the potential of converting an unused resource into a profitable export item. The linen project could see the introduction of a new crop with potential gross returns of $5,000 per hectare.

Altenative energy sources must be considered not only from the point of economics but also from reliability of supply. The price of diesel fuel to the farmer is irrelevant if the supply is unable to meet demand. Therefore, the benefits from the alternative energy projects are insurance against an ever increasing price of petroleum and an increasing uncertainty of supply.

ENVIRONMENT

INTRODUCTION

Because of SRC's long involvement in field data collection, it has participated in many environmental studies. Since multi-disciplinary capabilities in disciplines ranging from archaeology to radiochemistry exist at SRC, many of the jobs undertaken take advantage of this diversity.

During 1980, studies undertaken involved agricultural, manufacturing, mining, public utility, and government department clients.

As well as acting as a prime contractor in the environmental area, SRC undertakes sub-contracts with private companies in order to foster Saskatchewan expertise in this type of consulting.

ENVIRONMENTAL BIOLOGY

The preservation, protection and improvement of Saskatchewan's air, water, land, wildlife and aquatic resources are the concern of SRC's environmental program. Both industry and government have availed themselves of a core-group of Saskatchewan-trained professionals, supplemented by up to 20 summer assistants, through 17 contracts totalling more than $800,000 in 1980.

Among the major undertakings of the past year were:

- — Saskatchewan River Hydroelectric Projects — a detailed assessment of expected impacts, from proposed hydroelectric projects, on the natural plant communities and mitigative recommendations (Nipawin, Choiceland and Forks area).
- — Deep Bay Graphite — assessment of potential impact of proposed graphite mine east of Southend.
- — Claude Lake Uranium Mine — to obtain, analyze and interpret vegetation data for planned development of the Claude Lake orebody near Cluff Lake.
- — Aquatic Macrophytes (Cluff Lake) — To obtain quantitative data on macrophytes (Large-leafed aquatic plants) in Island Lake, Snake Lake and the tailings area in connection with milling operations at Cluff Lake. This is the first study of its kind in northern Saskatchewan and will aid in developing new research techniques.

Two multidisciplinary studies were conducted in conjunction with other areas within SRC.

- — A comprehensive review of potential effects of acid precipitation on vegetation and sensitivity of plant communities in northwestern Saskatchewan and northeastern Alberta.
- — The characterization of plant communities in the Athabasca Sand Dunes area of Saskatchewan and evaluation of their sensitivity to man-induced changes — particularly in the hydrologic regime.

A comprehensive baseline data study on natural vegetation, soils and field crops was done in the Poplar River area to assist in future monitoring programs at the thermal generating site. At Suicide Creek, near Outlook, Saskatchewan, a report was prepared for the Saskatchewan Museum of Natural History to identify species of vascular plants which may have contributed to the existence of an ancient culture at this important archaeological site.

The SRC, recognizing the diminishing need for its direct involvement in environmental impact assessments with the estabishment of several private firms working in this area in the province, is taking steps to direct its efforts at research programs which will improve the impact assessment process and assist others in performing these functions.

ENVIRONMENTAL ENGINEERING

Expertise in the ways in which industrial, agricultural and resource development impact on the environment, with access to data pertinent to Saskatchewan conditions, is available at SRC to conduct environmental assessments efficiently and economically. Where such studies point out gaps in the data, they can be filled in by basic studies.

Particular emphasis is being placed on the establishment of hydrologic and remote sensing data for Saskatchewan. Among the current projects are:

- — Laboratory and field studies on the use of artificial wetlands to provide tertiary treatment for municipal effluents and to evaluate the uptake of mercury, pesticide residues and radionuclides by aquatic plants.
- — A continuing study on the hydrology of small watersheds.
- — Six applied remote sensing projects involving airborne photography and satellite transmission of hydrologic data.
- — The provision of surface water hydrology input to six environmental impact assessment studies.

RADIONUCLIDE PATHWAY STUDIES

A study of the accumulation of radionuclides in fish from the Beaverlodge area is in progress. The radionuclides under investigation are radium-226, lead-210 and uranium. The fish have been collected from a drainage basin directly affected by a uranium mine operation.

The objectives of the study are:

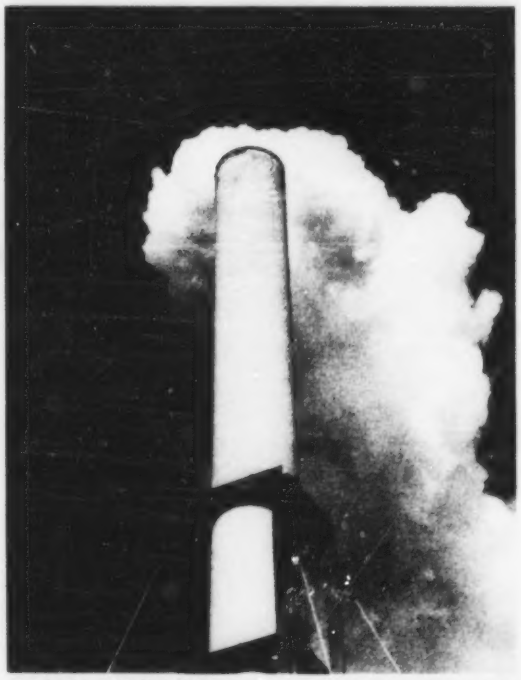
- — to discover whether there is significant accummulation compared with a control lake,
- — to investigate the distribution of these radionuclides among different tissues in the fish,
- — to ascertain which species accumulate the radionuclides to the greatest extent,
- — to relate the radionuclide concentrations in the fish to possible doses to humans resulting from consumption of these fish.

ASBESTOS IN PUBLIC BUILDINGS

A series of air samplings was conducted inside of the city's arena during active game periods to investigate the possible presence of airborne asbestos which could be eminated from untreated ceiling material. The concentration of inhalable asbestos in the arena ranged far below the safety limit set for the occupational environment by the province. However, there do not exist safety limits for non-occupational environment in the province at present. Similar samplings were conducted at one downtown office building and in a student residence in the university campus, and a school building in a rural community. Results of these analyses indicated the presence of airborne asbestos was below the safety limit set by the province.

STACK EMISSION TESTING

Specialized equipment and methods are required to determine the type and quantity of materials emitted from smoke stacks associated with processing plants and mines. A continuing program to develop facilities and methods for this activity is underway at SRC. During 1980, service was provided to several plants and mines at various points in the province.



STACK SAMPLING is a test program of specific interest to Saskatchewan industry. Environmental planners need to assess the impact of emission pollution on the environment, while process engineers require data to assist in developing material balance operations.

ACID RAIN

The Saskatchewan Research Council is operating a study of the acid rain problem on behalf of the environment departments of Saskatchewan, Alberta and Canada to determine the potential impact of acid rain on the two provinces named. Extensive background work on the problem has indicated need for further work. A proposed outline for ongoing studies of the problem has been prepared and submitted for approval.

PESTICIDE POLLUTION

Evaporation and drift of herbicides applied to Saskatchewan fields leads to inefficient weed control and stress on wildlife, sensitive crops, shelter belts and human health. Development of special meteorological instrument packages allows SRC to carry out field studies of aerodynamic and energy balance properties of crop canopies. In turn, this permits more accurate estimates of the transport of pesticides in the environment.

CLIMATOLOGY

Collection and analysis of climatic data allows for estimates of the dispersion of atmospheric emissions from different types of industrial operations. Work carried out by SRC during 1980 dealt with such emissions as radon, potash dust, sulphur oxides and carbon monoxide. These estimates facilitate environmental impact studies and the optimization of plant design for pollution abatement purposes.

SUNSHINE RECORDERS such as the ones shown here are useful in estimating solar energy inputs. These units, calibrated against the solar radiometer reference standards at SRC's Climatogical Reference Station are similar to those employed at about 30 sites throughout the province. Joe Calvert is shown obtaining data from the sunshine recorders.

INDUSTRIALIZATION

INTRODUCTION

The steady growth and diversification of Saskatchewan's industrial base, stimulated in part by the growth of resource industries, has created many opportunities and problems.

In order to deal with these effectively, SRC offers services in such areas as:

- management consulting,
- product development,
- manufacturing assistance,
- physical process consultation,
- industrial hygiene.

MANAGEMENT CONSULTING

The Management Consulting program provides consulting and training services, designed to improve the effectiveness and productivity of industries, businesses and government organizations in Saskatchewan. On a contractual basis, consultants conducted major marketing research, feasibility studies and management technology studies.

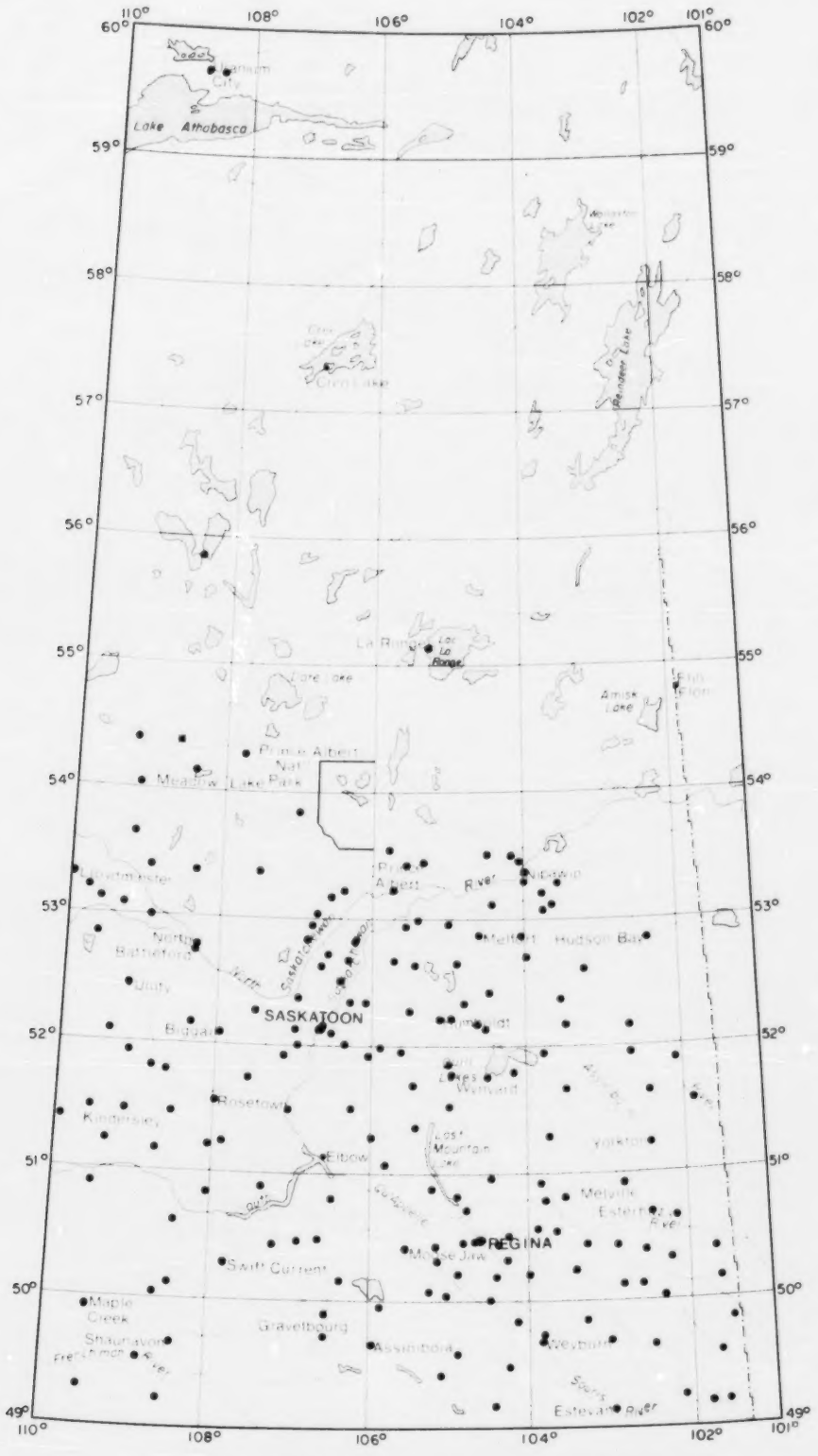
Some projects undertaken in 1980 included:

- market study which looked at the long-term prospects for a renewable energy product for a major chemical producer in Saskatchewan.
- comprehensive study for the improvement of productivity of underground operations of a major potash mine in the province.
- market research study which determined the potential for establishing a commuter bus service between Moose Jaw and Regina,
- consumer attitudes study for a major Saskatoon retailing operation,
- current research project to evaluate the effectiveness of an institutional ad campaign,
- study to determine the feasibilty of establishing a central co-ordinating office for a provincial volunteer service organization,
- preliminary feasibility study on the industrial development opportunities for a village in Saskatchewan.
- organizational plan to improve the effectiveness of a provincial volunteer service agency,
- investigation and assessment of the existence of a market for large aluminum grain boxes,
- study to establish recommendations to upgrade purchasing and stores practices for a large Saskatchewan city.

Technology Publications

The *Industrial Business Management Technology* bulletin, published monthly and mailed to over 4,000 industrial subscribers in Saskatchewan, contains articles and relevant information on management techniques for manufacturers and government organizations. The articles, which are written by SRC personnel or reprinted from a broad range of management publications, include such topics as:

- Reducing Risk of New Product Failure,
- Do You Know the Results of Your Advertising,
- Managing Your Boss,
- A Business Plan is More Than a Financing Device,
- How to Manage Your Time — One More Time,
- Motivation Makes Money,
- Developing New Accounts,
- Using Group Opinions for Decision Making.

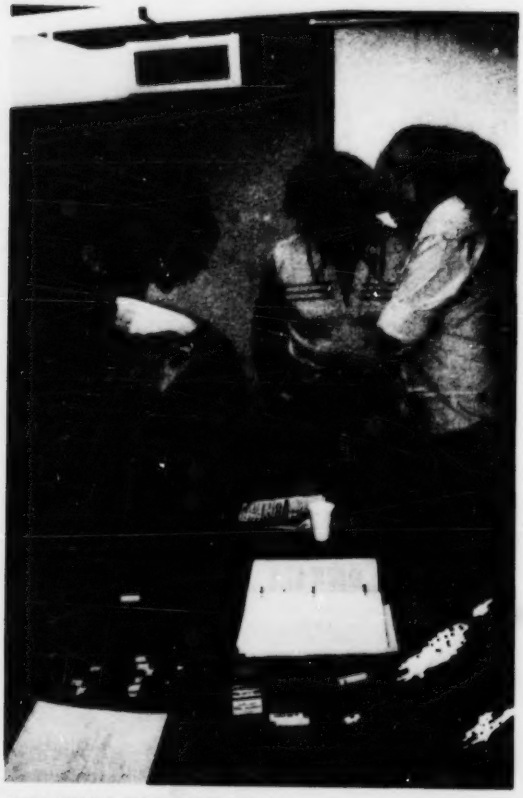


Locations of clients of SRC technical information services

Management Seminars

ISD sponsored nine public and two in-house management related seminars. The number and diversity reflected the specific needs of Saskatchewan business. They are designed for practicality to enable people to update their professional skills and to keep pace with the changing conditions of Saskatchewan business. The seminar topics included:

- Production Management,
- Hydraulic Machines,
- Welding Metallurgy for Foremen,
- Supervision,
- Time Management for Managers,
- Market Planning,
- Incentives.



WELDING TECHNOLOGY was the subject of a seminar attended by some 30 supervisors and foremen from various Saskatchewan industries. The seminar, a part of Industrial Services Seminar Series, was directed to the subjects of welding and metallurgy. Don Glossop, SRC metallurgical engineer, is shown examining a specimen prior to microscopic examination.

PRODUCT DEVELOPMENT PROGRAM

The objective of the Product Development Program is to provide services to industry that will assist them in applying the appropriate physical and informational technologies which will cause them to develop better, more world wide, competitive products and services.

Some benefits derived from the program in 1980 included:

- Computer modeling of products before building. Number of jobs — 7. Estimated savings in development and testing costs — $330,000.
- Re-design of prototypes for manufacture. Number of jobs — 6. Estimated sales next year — $710,000.
- Research on performance of product so new uses would open new markets. Number of jobs — 2. Estimated new sales next year — $1,000,000.
- Research on causes of failure so product could have longer life. Number of jobs — 5. Estimated replacement cost savings in one year $120,000.
- Assistance in computer selection and information handling. Number of jobs — 2. Estimated cost savings next year $20,000.
- Assistance in assessing the feasibility of new products and planning for their development. Number of jobs — 10. Estimated savings of misdirected development funds exceeds $1,000,000.

During this year the product improvement and design project has used value engineering and value analysis to assist Saskatchewan companies in new product feasibility and design management. A metallurgical lab and computer stress analysis service were available to investigate reasons for existing product failure. Finite element analysis and product testing techniques were used to determine "before building" the performance of new product designs. A computer consultation service was provided to assist industries in utilizing computers for project planning and production control. Educational literature was sent periodically to Saskatchewan industry to make them aware of developments in these areas.

Also, the SRC's Library was used extensively for literature searching to obtain information related to 90 percent of the jobs handled.

Product Development Management Program

The SRC manages a joint, federal-provincial program, sponsored by the Saskatchewan Department of Industry and Commerce and the Canada Department of Industry, Trade and Commerce, which assists Saskatchewan companies in the development and commercialization of new products. The program emphasizes the management of the product development process rather than financial support. This year, over 15 companies will be assisted through this program.

INDUSTRIAL MANUFACTURING ASSISTANCE

Technical Information Service

The objective of the continuing TIS program is to improve the effectiveness of secondary manufacturing through the transfer of the technological information to the client and in the implementation of that information. Coupled with the above, SRC's Industrial Engineers assist to optimize human, natural and financial resources and to increase productivity in the manufacturing function of companies on a self-help basis.

The IE program in past years has undertaken 83 projects with a variety of manufacturing companies. These cases involved improvements being introduced in plant layouts, production techniques, and inventory control; which resulted in savings of over $300,000. This converts to a benefit-cost ratio of 4:1.

The Technical Information Service has strived to visit all manufacturers in the province on a routine basis.

During the last year over 475 plant visits were made by the two TIS personnel. As a result of these visits and direct contacts, over 950 inquiries were handled by the service.

The easily defineable benefits amounted to over $300,000 in reduced costs and 6-8 jobs created or saved.

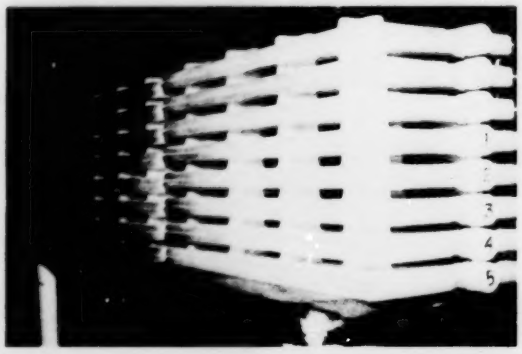
In addition to the above activities, the program managed the Science and Engineering Student Program in the province for NRC. The program saw 19 students undertake short-term projects within industry.

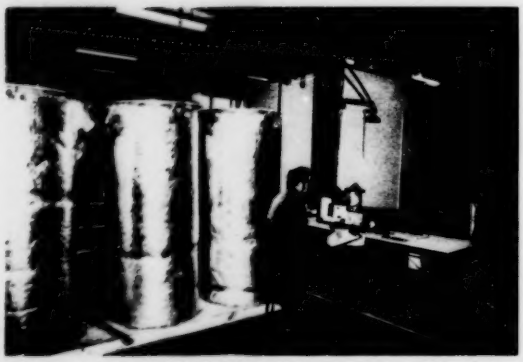
PHYSICAL PROCESS CONSULTING

Industrial Development

Saskatchewan industry, in general, does not have ready access to appropriate technology, or cannot afford technical staff, especially in the research function. SRC staff have a broad range of experience and expertise to identify major problems and provide solutions.

SRC staff can provide technical support to develop and/or optimize processes and technologies to maximize productivity and profitability in Saskatchewan industry. This results in an increased value of resources, production of marketable goods and services, greater em-





SASKATCHEWAN MINERALS has contracted the Saskatchewan Research Council to carry on studies using Glauber's Salt as a heat storage medium. Special plastic trays, designed and fabricated by the Council, are employed to act as a storage medium for heat produced from solar sources or from off-peak power. Sodium sulphate is an excellent heat storage medium, but is difficult to deal with due to the manner in which it changes from a solution to a solid. Sodium sulphate in large containers is also useful for heat storage purposes. Sodium sulphate brine capped with oil is monitored as a heat storage experiment proceeds. Nick Nicolichuk is shown recording data from an experiment run.

ployment, improved standard and quality of life, and stabilization of economic growth.

During the past year, pilot plant programs were carried out on the utilization of sodium sulphate for thermal energy storage. Work was begun on a pilot plant study to optimize uranium recovery from a specific ore body, and a number of smaller studies involving the removal of radium 226 from water, potential for leaching harmful elements from waste rock, and general water quality investigation were carried out.

SRC scientists are maintaining a watching brief on heavy oil technology and the gasification of coal as possible future programs.

Transportation Engineering

The price of Saskatchewan bulk commodities is substantially increased by freight costs before reaching markets in eastern Canada or off-shore. The use of slurry pipeline transportation (involving the suspension of solids in a liquid carrier) can, in many instances, reduce costs.

Slurry pipeline technology has been the subject of an 18-year, ongoing research program at SRC.

A focal point of recent studies has been the transport of coarse coal material, in a water slurry, over short distances (less than 80 kilometres). One application of this is in the production of electric power from thermal generating stations which requires massive movement of coal.

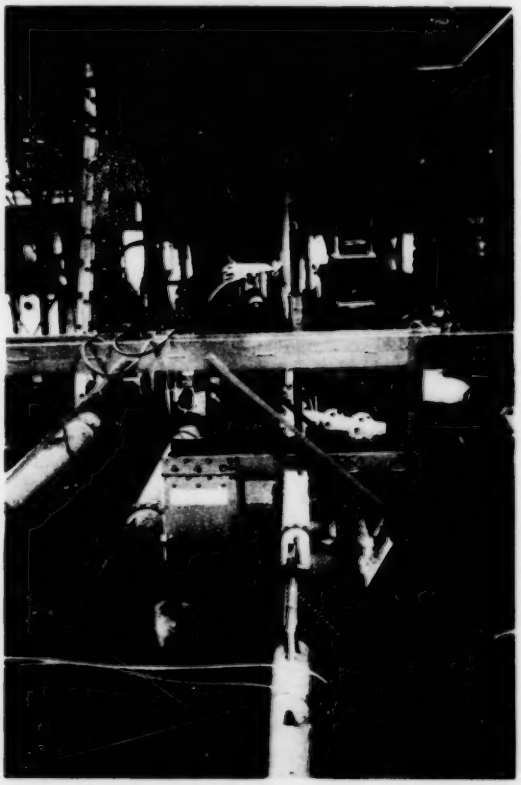
Slurry pipeline transportation studies have also been conducted on the disposal of tar sand tailings and coal-in-oil slurries.

Results of a number of SRC's pipeline transportation studies have been published in open literature, thereby advancing the state of the art in this field. Both private and government clients have sponsored research totalling more than $2,000,000 over the life of this program.

Energy Engineering

As a direct result of SRC's leadership in energy conservation projects such as the Saskatchewan Conservation House, many Saskatchewan building contractors are now constructing high quality, energy efficient houses in the province. As well, many private builders, who require advice in this field, have been given design assistance by SRC that has enabled them to avoid costly mistakes during construction.

Advice is disseminated by various means: through private discussions with tradespeople and individual homeowners, and through speaking engagements to various interest groups. SRC has been particularly active in assisting the Energy Conservation Information Centre in its new programs — both technically and financially.



HYDRAULIC TRANSPORT OF SOLIDS has been the subject of an 18-year study by the SRC. The purpose of this research has been to accumulate data on solids pipelines as they might be applied to use in Canada. Recently, this program has concentrated on a study of transportation of coarse material coal slurries over short distances (less than 80 km). To facilitate these studies, the SRC has constructed an extensive network of test pipelines in a laboratory building dedicated to this purpose.

Conservation House

Lessons learned from the Saskatchewan Conservation House project in Regina, which was managed by SRC, will be a basis for energy efficient housing in this province. The project established four yardsticks for energy efficient design: economically justifiable levels of insulation, heat infiltration, tight air-vapour barrier construction, and controlled and efficient air management. Occupied by a typical family from the beginning of November 1979 until the end of June 1980, the house functioned on a projected annual natural gas fuel bill of $45 for domestic hot water heating and $30 for space heating.

Vapour Barriers

A potential reduction of $300 in the capital cost of an energy efficient home is the result of a cost-effective, air-vapour barrier guideline established by SRC. Another area under study is the problem of ceiling sag, suspected to be caused by increasing insulation levels. This investigation was carried out under contract from HUDAC.

Retrofit

Six demonstration houses have been established in Yorkton, Moose Jaw, Swift Current, Weyburn, Prince Albert and Melville to provide technical and economic information needed to reshape future programs and policies on retrofit housing.

Retrofit is an infant science and there is much to be learned about the technical problems and real costs. Current retrofit programs may be failing to achieve their maximum potential of a 40% energy saving because they are poorly suited to technical and economic realities. Information from these retrofit demonstration studies will provide the practical foundation needed for future successful programs.

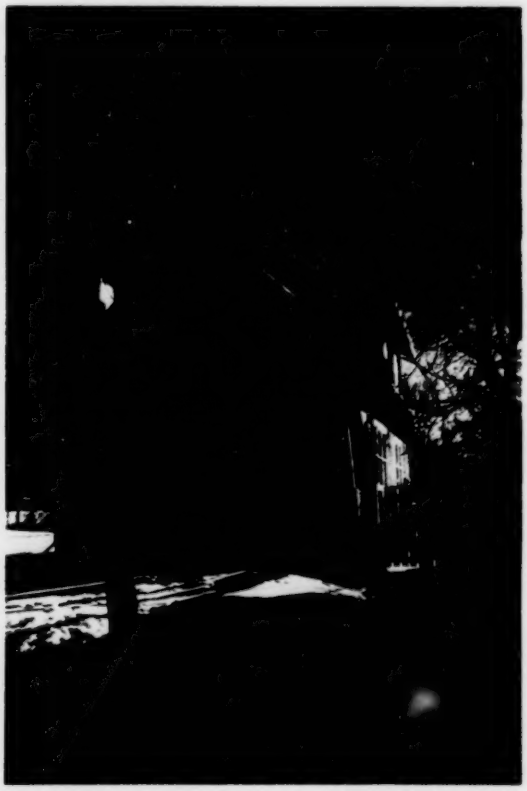
Saskatoon Energy Showcase

The Energy Showcase, a joint venture of the federal and provincial goverments and HUDAC, and part of Canada's International Energy Agency Demonstration, has been opened to the public in Saskatoon. During design and construction phases, SRC played a major role in setting up a technical review group and in serving on this group to ensure that the stringent design requirements of an energy efficient home were met.

A typical incremental cost of $5,500 has produced a marketable home with high levels of energy efficiency. The project has been warmly praised by experts who have toured the homes, and is adding to Saskatchewan's "leading edge" reputation in energy efficient housing.

Ceramic Engineering Research

The development and promotion of economic uses of this province's considerable clay resources have been the focal point of a long-term, comprehensive research program at SRC, and more recently in co-operation with the Saskatchewan Department of Industry and Commerce.



RETROFIT of this 50-year-old home in Weyburn, Sask. included complete re-insulation of ceilings, walls and the basement, as well as rehabilitation of doors, windows and electrical and plumbing services. This was one of six homes in six Saskatchewan communities selected for demonstrating this energy conservation program.

Ladle brick, because of its significant refractory qualities, is a particularly valuable product. An experiment involving the addition of St. Victor volcanic ash to a Cactus Hills clay has achieved some success in an effort to produce bloat on reheating, thus yielding a valuable lightweight aggregate form of ladle brick.

Work continued on developing processes to utilize Saskatchewan's abundant bentonitic clays. They may be made capable of crack-free drying by the addition of ammonia or potassium, however, ejected salts can cause scumming. Studies were done on combustible coatings to divert the scumming salts from the surface of the ware, with some noteable success.

INDUSTRIAL HYGIENE

Potash Dust Control

Dust control techniques of underground mining have been investigated by Saskatchewan Mining Association's Potash Division. A research grant was made jointly to the Department of Social and Preventive Medicine of the University of Saskatchewan and SRC to develop an instantaneous readout dust mass monitor for water soluble dust. An experimental model was laboratory-calibrated and then tested underground to determine its sensitivity and characteristics with mixed compounds. Several sets of prototype monitors will be constructed and brought into practical use by the potash industry within a year.

Radon Chamber

A radon chamber was constructed to investigate the characteristics of high efficiency particulate air filters (HEPA) with radioactive aerosols. The HEPA filters are used with cabs of mining equipment in open-pit mining of uranium. The chamber with calibrated radon generator has additional capabilities of calibrating radiation measuring instruments for mining industries.

Uranium Mine Exposure Study

A series of field measurements was conducted at one of the open-pit mining sites to investigate the worker's internal exposure to inhaled radioactive aerosols and quartz in uranium mining operations. In co-operation with the university's Department of Social and Preventative Medicine, samples were collected inside and outside of the equipment cabs for respirable dusts and radioactive gas while nine pieces of equipment were engaged in mining high grade ore and overburden removal. Effects of the cab construction, cab pressurization, filter efficiency, uranium content of ore, and housekeeping on the penetration of radioactive material and quartz into the cab and workers possible internal exposure were studied.

RESOURCES

INTRODUCTION

Saskatchewan's resources sector, including potash and uranium at present with heavy oil showing promise for the future, is stabilizing and enriching the province's economy. Renewable resources, such as forests, are taking on further importance. Groundwater, when properly managed is a renewable resource important to rural and urban residents alike.

The Saskatchewan Research Council, through both continuing programs and short-term projects, has been concerned with the resources sector since SRC's inception.

WATER RESOURCES

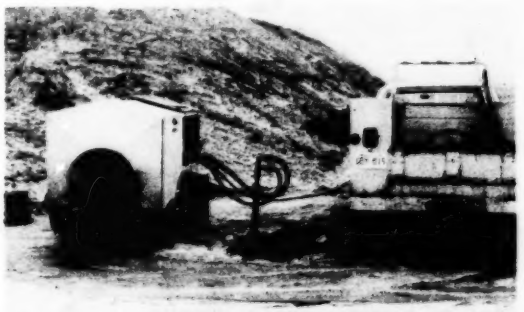
Groundwater Resources

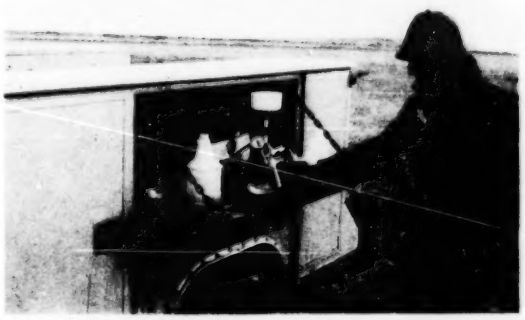
The near drought conditions of 1980 have further reinforced the fact that seven of every ten Saskatchewan residents are wholly or partially dependent on groundwater supplies. Drought-proofing programs are a must for the continued stability of the province's economy and way of life.

For over two decades, SRC has been systematically collecting and compiling data on the geology, quantity, and quality of groundwater resources in the populated portion of the province. This ongoing activity is complemented by an established network of 49 observation wells which monitor fluctuations in groundwater levels and their relationship to climatic changes. The latter data is used to predict short-term future groundwater trends.

Information derived from this program is made available, on request, to government, industry, municipalities and private citizens in the form of maps, reports and basic information on specific request. The general information gathering process and expertise in this field accumulated by SRC facilitates undertaking of commercial contracts concerning all aspects of groundwater.

The groundwater program is also aimed at investigating and developing new methods and approaches to evaluating groundwater quantity and quality, and detecting groundwater pollution. Increasingly more precise information on





ENVIRONMENTAL CONTROL is facilitated through water sampling at a potash mine site. Samples are obtained from a piezometer network surrounding the brine pond. SRC technician Ed Jaworski is shown filtering the sample prior to sending to the lab for analysis.

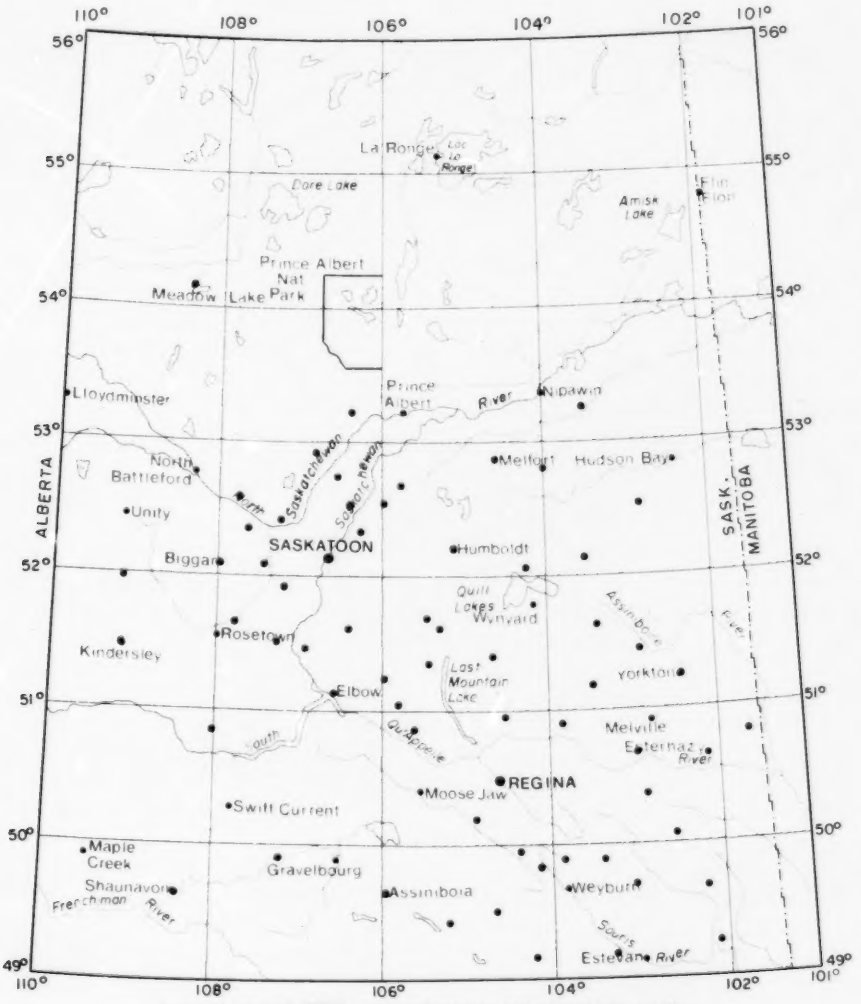
the location, quantity and quality of groundwater permits more realistic allocation, control and protection of this valuable renewable resource.

A new series of maps and reports, beginning with the Saskatoon area (73-B), will provide much more detailed information on specific aquifers than did the previous series of 21 *Geology and Groundwater Resources* maps, covering the populated portion of the province at 1:250,000 scale. A project is also underway to develop new methods of predicting from the distribution of surficial materials, water quality in aquifers occurring between the ground and bedrock surfaces. These aquifers are of prime importance as more than 80 per cent of presently producing wells in Saskatchewan are completed in this zone.

Other major studies of the past year included the Athabasca Sand Dunes area, as part of a comprehensive environmental project; a preliminary assessment of the Hatfield Valley Aquifer System in the Melville area (62-K,L), for the Saskatchewan Department of the Environment; and the publishing of the 1980-81 groundwater level trend forecast, based on the observation well network data.

FREEZE DESALINATION

In much of the settled area of Saskatchewan, brackish groundwater is the only reliable water supply. A simple, inexpensive desalination



Locations of SRC groundwater observation wells.

method for provision of water of improved quality would upgrade the quality of life, reduce stress of livestock, and extend the life of plumbing equipment, particularly water heaters and taps. Reductions would also be achieved in soap and detergent requirements and the lifetime of clothing and linens would be extended.

The development of such an economical method of water desalination, using the natural refrigeration available during Saskatchewan winters and suitable for application on a small scale as required by individual farms or small communities, has been achieved by SRC.

Spray freezing trials have been done successfully since 1975 on various types of groundwater and in various climatic conditions. These trials have shown that spray freezing can be the most economical way to supply potable water to farms and small communities.

QUATERNARY GEOLOGY

Specific definition of aquifers that sustain the delicate balance of groundwater supply and demand in Saskatchewan and sand and gravel resources for road construction and urban development are facilitated by SRC's ongoing Quaternary geology program.

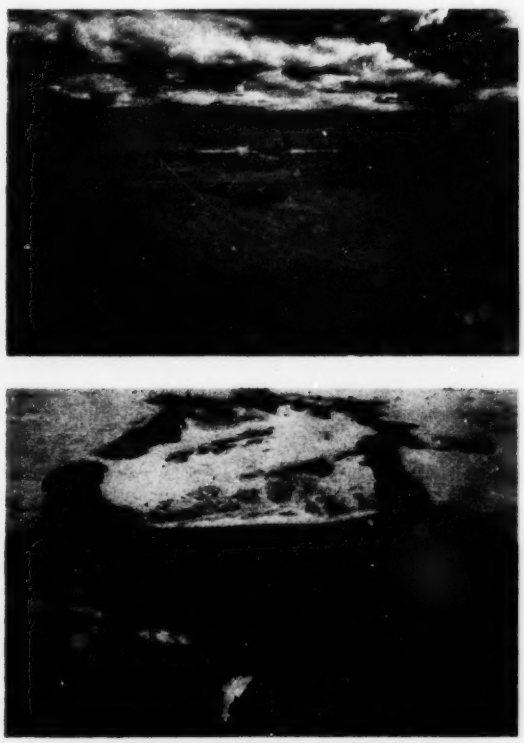
Seventy percent of the province's population is wholly or partially dependent on groundwater supplies and 80 per cent of supply wells are completed in drift aquifers (between the ground and bedrock surfaces). Therefore, a concentrated effort must be maintained to achieve the best possible delineation of this renewable resource.

The construction of roads and highways to facilitate access and transport of Saskatchewan's multiplicity of resources, as well as urban development to provide for the needs of its growing population, will require increased quantities of sand and gravel. Economic deposits must be found throughout the province to meet the demands of present and future needs.

The key that will unlock both of these valuable resources is a better understanding of the geologic processes that formed them. SRC's program of systematic mapping, drilling and sampling provides data on the distribution, stratigraphy and properties of Quaternary (glacial) sediments to determine their history and origin.

This program also provides important baseline data for environmental studies and, in the north, can form the basis for drift prospecting for the tracing of ore deposits. To the archeologist, it serves as the framework into which can be placed important discoveries concerning ancient aboriginal cultures and their one-time occupancy of an area.

Currently under investigation is the geological setting of the *GOWEN II* site, a recent archeological discovery in the southwest corner of Saskatoon. Planners of bridge sites, valley crossings, and commercial and residential developments have sought out the valuable collection of geotechnical data which has resulted from these programs.



A FOSSIL PINGO, located in the dune area south of Lake Athabasca, is a frost mound of soil raised by the hydrostatic pressure of ice-core expansion. This indicator of former permafrost conditions was discovered during a study of Quaternary deposits of northern Saskatchewan.

URANIUM OREGENESIS

Between 25 and 30 per cent of the known uranium reserves of the western world are found in unconformity type deposits, which were first discovered as a uranium source in 1968. Found mainly in Canada and Australia, these deposits are located in close spatial assocation between Archean and Lower Proterozoic metamorphic basement rock and the overlying, unmetamorphosed Middle Proterozoic rocks comprised of sandstone and conglomerate.

These unconformity type deposits are extremely rich in comparison with the more "conventional" deposits (often by factors of ten), but are much harder to locate due to their smaller size. Therefore, any criteria which can be applied towards enlarging the exploration target is of vital importance to prospecting.

Detailed studies of uranium ore genesis are being carried out at Rabbit Lake, Maurice Bay and Midwest Lake by means of field mapping, sampling, laboratory studies and analysis. Exploration target enlargement studies are in progress at Midwest Lake, Dawn Lake and Key Lake.

Geochemistry and mineralogy are tools employed by SRC to devise better exploration techniques. Elevated trace metal content in drill hole cores near a possible orebody can be found through geochemical analysis, while the influence of the uranium-forming process on clay mineral assemblages can be detected by X-ray diffraction techniques.

The SRC has developed a quantitative X-ray diffraction technique which may readily identify diagnostic clay mineral assemblages. SRC's X-ray diffraction laboratory is working primarily in this area and has handled 1200 samples from a variety of commercial clients over the past year.

Revised exploration concepts are the aim of SRC's uranium ore-genesis program, both in Saskatchewan and throughout the world.

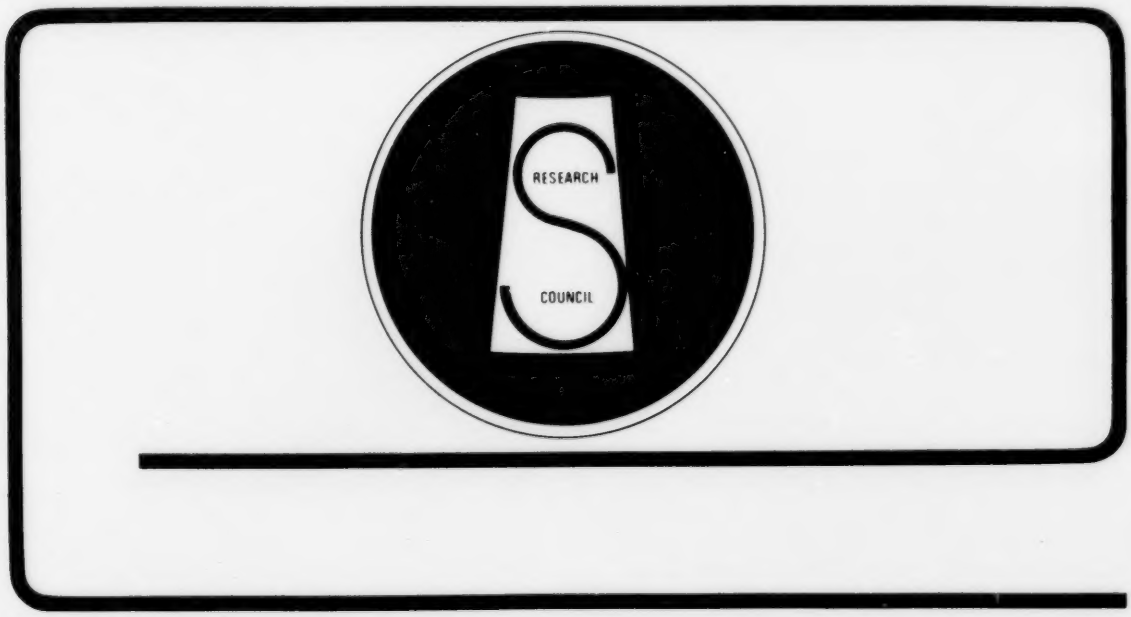
RESOURCE INFORMATION

As SRC's ongoing programs generate voluminous files concerning resources and environment, extensive effort is devoted to put these data in a computer-accessible form so they can be used quickly and cheaply.

Files are maintained concerning:

- chemical and geophysical data on lignite resources and on a seam basis,
- groundwater levels and quality,
- surface water levels.

Capabilities at SRC include those required for digitizing analog records, checking and filing the information, producing various tabulations, preparing computerized plots, sharing data with other computers, particularly those of Sask-Comp and the University of Saskatchewan, and designing software to meet user requirements.



SERVICES

INTRODUCTION

The sophisticated research program operated by SRC requires support from a number of service units. High technology services, not otherwise readily available in Saskatchewan, are offered by SRC to various clients on a fee-for-service basis. Among the services offered are:

- chemical analyses,
- electronics design and servicing,
- graphics,
- precision machining.

Benefits accuring from SRC's service programs include reduced costs for in-field service and reduced "down time" on complex equipment. SRC services are frequently an alternative to bringing service staff in from Eastern Canada or the USA.

CHEMICAL ANALYSES

Analytical and Radiochemistry

Continued high demand for analytical services led to the relocation of the main analytical laboratory in the Resources Research Facility, part of the Saskatoon Research Park. Provision has been made in the new laboratory for a SLOWPOKE nuclear reactor, scheduled for installation in 1981. The new facilities ensure SRC's position among the most complete analytical units in Canada.

RADIOCARBON DATING

Radiocarbon carbon-14, naturally produced in the atmosphere, is absorbed into living material or into sediments by natural processes. Carbon-14, with a half life of 5730 years is a good indicator of the sample's age, up to 33,000 years.

SRC's Carbon-14 Dating Laboratory offers a facility unique to Western Canada for the dating of samples submitted by archaeologists, geologists, pedologists, geographers and ecologists. Age dating gives them insight into glacial history phases, progress of aboriginal cultures, ancient climatic trends, or the succession of plants in prehistoric times.

The SRC facility includes four, specialized gas-flow counters, and the apparatus for sample preparation. A significant improvement in ancient bone sample preparation technique, devised by SRC technicians, has accomplished a greater dating precision of such samples.

In 1980, 216 samples were analyzed from more than 20 client sources. Over 75% of these were archaeological objects. A long-term contract with the National Museum of Man accounted for about one-half of the facilities activities.

GRAPHICS LABORATORY

This group provides cartographic, in-house photomechanical, drafting, base map and air-photo library services to meet internal needs and is available for external contracts, particularly in the graphics and publications consulting area.

The base map library consists of a collection of stable-base, film separations of individual data required for the production of fifty-one 1:250,000 scale topographic maps which cover Saskatchewan. These can be provided to the user in any data combination (such as contours, drainage, roads etc.), or scale variation, to suit specific user needs.

The air-photo library contains complete, 1:50,000, semi-controlled mosaic coverage of the entire province, 1:40,000 stereo-pair coverage of the province, the 1970 LIFT Program imagery, and a set of 4 inches = 1 mi historical photos covering the populated portion of Saskatchewan. This multi-temporal coverage af-

FOREST FIRES cost the province millions of dollars annually in lost timber resources and fire suppression costs. SRC has assisted the Department of Northern Saskatchewan's Forest Protection Branch in the development of a series of fire control maps and the establishment of a lightning strike plotter system for the northern forest area, to expedite future fire fighting operations.

fords users the opportunity of studying physical features which may have been modified or removed by more recent events (construction, fire, landslides, etc.).

A significant contract was undertaken with the Department of Northern Saskatchewan, Forest Protection Branch. Consulting and technical services were provided toward the production of nineteen, 1:250,000 maps to expedite fire fighting operations in the northern forest area. As well, a specialized base map was produced for use in conjunction with a lightning strike plotter, recently installed by this branch.

A spin-off of this contract was the training of several DNS drafting staff in scribing and advanced graphics techniques which will become a part of their ongoing service to the department. This is the sixth department or agency which has been assisted in updating their graphics techology.

The unit has developed a prototype for the forthcoming series of aquifer maps and reports to complement the previous series of 21 "Geology and Groundwater Resources" maps, now completed.

INSTRUMENTATION GRAPHICS

This unit performed a special assignment during 1980, in connection with workspace design for the SRC groups relocating in the SEDCO Centre. Office and laboratory space for the Division of Industrial Services, the Environmental Biology group, the Electronics Laboratory and the Geophysics group, together with clerical support, were laid out to secure optimum utilization.

Also, the unit continued its regular program of providing technical drawings, reports, brochures, posters and displays in support of design and measurement programs and conferences such as the Energy Show.

ELECTRONICS LABORATORY

Highlights of the laboratory's 1980 program include:

- the design and construction of a microcomputer-based system to monitor the vital signs of surgical patients for the Haemodynamics Laboratory, University Hospital,
- negotiation of a contract to operate the Canadian Service Centre on behalf of Eberline Instruments, a major supplier of equipment to the nuclear industry,
- development and construction for W.A. Meneley Consultants of a network to measure temperature inside radioactive waste containers.

The laboratory continued to provide service to numerous external clients and to support the internal research program.

SRC's ELECTRONICS LABORATORY designed and developed a computerized system for the University of Saskatchewan Hospital to aid in monitoring a patient's physiological vital signs during a Cardiac Catheterization procedure. SRC electronics engineer Terry Locke is shown observing the unit in operation.

PRECISION MACHINES

Some nine types of major instruments, not otherwise commercially available, were turned out during 1980. Among these items were automatic water sampling equipment, special uranium analysis apparatus and equipment for the Defence Research Board.

SPECIAL SERVICES

Plastic Technology

A facility to provide plastic fabrication services for SRC's internal program became more heavily involved with external clients during 1980.

Among other services performed by this unit were:

- design and prototype moulding on an air manifold for a straw spreader,
- design and prototype moulding of a special pill dispenser,
- design and prototype for a positive action fishing gaff.

X-RAY DIFFRACTION ANALYSIS LAB

The acceptance of an SRC-developed quantitative X-ray diffraction technique to readily identify diagnostic clay mineral assemblages as an indicator of uranium prospects has placed a high demand for service on this facility.

The lab is presently providing clay analysis services for in-house uranium research and to the exploration industry of Saskatchewan. The entire demand for this service must be borne by SRC as there is no other production X-ray diffraction facility in the province. Total earnings from samples submitted by the industry will be $150,000 for this year.

A second X-ray unit has been assembled from spare parts and is being manned by sufficient staff to enable the facility to operate on a shift basis, 24-hours-a-day, seven-days-a-week, to cope with the demand for analysis.

SEDIMENTARY LABORATORY

Mechanical analyses of unconsolidated glacial sediments such as sands, gravels, silts and clays may be used to classify sedimentary units that are problematic in field interpretations and to aid in the determination of hydrologic parameters.

Set up to assist field investigations of surficial geology, this facility performs mineralogic analyses to determine mineral content, textural analyses to determine particle size, and carbonate analyses to aid in correlating isolated stratigraphic units. During the year, over $10,000 worth of analyses were done for four commercial clients.

IN-HOUSE CHARTER FLYING SERVICE

The success of a scientific program or study can often rest on the ability to access remote locations. In many cases, accessibility by air may be the best means of expediting results.

SRC is fortunate in having on its staff a technician/pilot to provide an in-house charter flight service. During 1980, 12 projects were served, consuming a total of over 400 flying hours. Due to the considerable experience of the technician/pilot, (over 5400 hours in single, twin and turbine engine aircraft) a wide variety of aircraft are available to SRC projects and needs. Otherwise, the cost involved in contract chartering might prove a serious deterant to some projects.

SRC's IN-HOUSE "CHARTER FLYING SERVICE" provides the flexibility of transport that is often required for the success of remote field programs. Technician/pilot Bob MacPherson prepares a rented aircraft for a flight to one of SRC's northern project sites.

SASKATCHEWAN RESEARCH COUNCIL LIBRARY

The Saskatchewan Research Council Library provides information services for the Council's research staff, clients and where appropriate, its public. This is accomplished by acquiring books, reports, journals and other documents needed for Council projects. Reference ser-

vices are available to all library users. These include the provision of a wide range of abstracts and indexes, a core collection of reference materials, directories, etc. and outline information retrieval providing access to over two hundred data bases in a multitude of disciplines.

In the absence of revenue the benefits could be taken as the costs which for this year are $115,000. The library currently has a full-time staff of four involved in all aspects of the library's public and technical services. The library's greatest benefit is the collection itself which contains a significant body of scientific and technical literature of a level and quality unavailable in any other collection in the province.

Through the implementation of CODOC, an automated indexing system, the library has converted records for 2,000 of its holdings into a machine readable format. This has significantly improved the ease and efficiency of access to the collection. The CODOC system will also allow the SRC Library to produce microfiche of its holdings and distribute them to other libraries in the province. This year the Library expects to process over 3,000 interlibrary loan and purchase requests and conduct in excess of 150 online searches. The collection is expected to grow by some 1500 volumes.

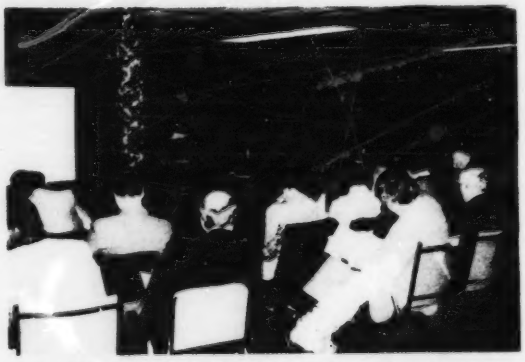
SRC PLANS FOR THE FUTURE

During 1980, the staff of the Council initiated an extensive Long Range Planning project designed to provide a sharpened focus on the direction in which the Council should move during the 80's and towards the end of the century. In developing this long range plan, SRC obtained the participation of more than 500 "outside" persons in business, government, universities, and associations. These outside specialists provided a major input into the developing plan.

By the end of 1980, a first draft of the long range plan was in the preparation stages prior to being widely disseminated for discussion and feedback into the final plan.

By the early summer of 1981. The completed plan will be in place and implementation is planned.

The results of the plan will be a reallocation of the resources and the efforts of the organization towards targeted program areas which will optimize the effective implementation of technology throughout Saskatchewan. It will provide a better means of keeping all sectors of the economy more aware of future implications, and will consist in the technological means of taking best advantage of Saskatchewan's abundant opportunities.



A LONG RANGE PLAN, being developed to provide future direction for the effective application of technology by the Saskatchewan Research Council for the benefit of the Province, was the subject of a meeting. Reports, from ten task forces, comprised of SRC personnel and outside experts, which will form the basis of the plan, were presented.

PUBLICATIONS

Agriculture

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January, 1980
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March, 1980
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104 Archaeological Resource Survey of Lac La Ronge Provincial Park
Northern Saskatchewan
James S. Wilson and James Light
April, 1980
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THE UNIVERSITY PROGRAM

SCHOLARSHIPS

The Government of the Province of Saskatchewan offers graduate research scholarships, tenable at either the University of Saskatchewan or the University of Regina. The purposes of the awards are to assist graduate students to prepare for careers in scientific and industrial research, and to create interest in the exploitation of Saskatchewan's resources and in techniques that will advance the development of the Province. SRC conducts the selection of the candidates.

Awards valued at $6,000 for the year beginning October 1, 1980 were made to:

Barry M. Olson, Soil Science Department,
University of Saskatchewan

Richard M. Siu, Agricultural Economics Department,
University of Saskatchewan

Brenda C. Dale, Biology Department,
University of Regina.

Since its creation in 1947, the Saskatchewan Research Council has provided grants to applicants in Saskatchewan Universities for applied research in the sciences. Eighteen grants totalling approximately $97,000 were awarded in 1980 to applicants at both the University of Saskatchewan and the University of Regina.

The following projects are presently receiving support under the grants-in-aid program:

GRANTS-IN-AID

UNIVERSITY OF REGINA

FACULTY OF ADMINISTRATION

Prairie entrepreneurship
under the direction of Professor D. E. Shaw

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Phosphorus metabolism in high-protein, frost resistant potato hybrids
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DEPARTMENT OF CHEMISTRY

Electrochemical gasification of coal
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DEPARTMENT OF INDUSTRIAL SYSTEMS ENGINEERING

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Radium-barium sludge fixation
under the direction of Professor P. M. Huck

REGINA WATER RESEARCH INSTITUTE

Microbiological investigation of the processes involved in the percolation of waste effluents over gravel beds.
under the direction of Dr. D. R. Cullimore, Director, Regina Water Research Institute.

UNIVERSITY OF SASKATCHEWAN

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Development of an electronic temperature monitor for use in animal barns
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DEPARTMENT OF BIOLOGY

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under the direction of Professor J. Krahn
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Digestibility studies on pea protein concentrate
under the direction of Professor R. S. Bhatty
Wheat tissue ice formation
under the direction of Professor L. V. Gusta
Techniques for use of legumes to improve soil nitrogen
under the direction of Professor L. A. McLean

INSTITUTE FOR NORTHERN STUDIES

Land use in Northern Saskatchewan
under the direction of Dr. R. M. Bone, Director, Institute for Northern Studies

DEPARTMENT OF HOME ECONOMICS

Utilization of Saskatchewan cereals and legumes in baked, pasta and snack foods
under the direction of Professor A. K. Sumner

DEPARTMENTS OF HORTICULTURAL SCIENCE AND MECHANICAL ENGINEERING

Utilization of stack gases from a coal-fired boiler for greenhouse cucumber production
under the direction of Professors E. A. McGinnes and G. H. Green

INSTITUTE FOR NORTHERN STUDIES DEPARTMENT OF PLANT ECOLOGY

Lake Athabasca terrain ecology
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Lehtinen, J.	B.Sc.
Lychak, J. V.	
Mack, H.	W. Sc. Tech.
Macnab, R.	
Marshall, B.	
MacPherson, R. J.	
*McCarthy, B. P.	Civ. Eng. Tech.
McEwan, D. J.	
McKnight, R.	
Meginbir, G. A.	B.A.
Nicolichuk, N. A.	Civ. Eng. Tech.
Opsal, J. O.	B.Sc., P.Eng.
Ostwald, W. Jr.	
Owens, K. A.	
*Pizzey, B.	Chem. Tech.
Pope, B. C.	
Schergevitch, P.	
Shook, K.	
Small, M.	Chem. Tech.
Smith, B. J.	
Spyker, J. W.	B.E., M.Sc., P.Eng.
Volden, R.	B.Sc., M.Sc.
Voth, T.	
Wheaton, E.	B.Sc., M.Sc.
Whiting, J. M.	B.Sc., M.Sc.
Woods, D.	Elec. Eng. Tech.
Wright, J.	

* Terminated employment during 1980.

SASKATCHEWAN RESEARCH COUNCIL FUND

FINANCIAL STATEMENTS

Year Ended March 31, 1980

AUDITOR'S REPORT

To the Members of the Legislative Assembly
of the Province of Saskatchewan:

I have examined the balance sheet of the Saskatchewan Research Council Fund as at March 31, 1980 and the statement of operations and balance of fund for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1980 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Regina, Saskatchewan
June 26, 1980

W. G. Lutz, F.C.A.,
Provincial Auditor

M121

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SASKATCHEWAN RESEARCH COUNCIL FUND

BALANCE SHEET

MARCH 31, 1980

(with comparative figures at March 31, 1979)

ASSETS

	1980	1979
Current:		
Cash in bank	$ —	$ 4,251
Guaranteed savings deposit	—	15,715
Investments, at cost which approximates market value	50,000	30,000
Accounts receivable	881,955	744,590
Shareable costs recoverable	18,237	18,237
Prepaid expenses	25,932	23,271
Total current assets	976,124	836,064
Investments, at cost which approximates market value	—	20,000
Investment in and advance to subsidiary (Note 3)	3,420	2,895
Equity in Saskatoon Co-operative Association	400	324
Fixed: at cost		
Laboratory equipment	1,317,,479	1,108,443
Building	783,491	647,860
Automotive equipment	161,258	163,460
Furniture and fixtures	194,602	193,491
Shop equipment	94,515	97,026
Land	11,000	10,000
	2,562,345	2,220,280
	$3,542,289	$3,079,563

LIABILITIES

	1980	1979
Current:		
Bank indebtedness	$ 89,244	$ —
Research grants payable	56,287	54,301
Accounts payable	254,146	59,374
Employee deductions payable	102,277	100,220
Retroactive salaries payable	27,914	—
Deferred income	42,763	34,315
Total current liabilities	572,631	248,210

EQUITY

Equity in fixed assets (Schedule 2)	2,562,345	2,220,280
Balance of fund (Statement 2)	407,313	611,073
	2,969,658	2,831,353
	$3,542,289	$3,079,563

(See accompanying notes to the financial statements)

SASKATCHEWAN RESEARCH COUNCIL FUND

BALANCE SHEET

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(with comparative figures at March 31, 1979)

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(See accompanying notes to the financial statements)

Statement 2

SASKATCHEWAN RESEARCH COUNCIL FUND

STATEMENT OF OPERATIONS AND BALANCE OF FUND

Year Ended March 31, 1980
(with comparative figures for the 1979 year)

	1980	1979
Revenue		
Contracts and fees from industry and government	$3,153,027	$2,629,924
Province of Saskatchewan — grant	2,599,000	2,517,950
	5,752,027	5,147,874
Expenditure (Schedule 1)	5,963,090	5,108,914
Excess of (expenditure over revenue) revenue over expenditure before the following:	(211,063)	38,960
Other income	99,461	52,738
	(111,602)	91,698
Research grants	92,158	68,901
Excess of (expenditure over revenue) revenue over expenditure for the year	(203,760)	22,797
Balance of fund, beginning of year	611,073	588,276
Balance of fund, end of year (Statement 1)	$ 407,313	$ 611,073

(See accompanying notes to the financial statements)

Schedule 1

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EXPENDITURES

Year Ended March 31, 1980
(with comparative figures for the 1979 year)

	Admin.	Chem.	Eng.	Geology	Indus. Services	Physics	1980 Total	1979 Total
Employee benefits	$ 24,273	$ 60,859	$ 74,311	$ 50,360	$ 34,875	$ 49,064	$ 293,742	$ 307,560
Fixed asset purchases	151,202	238,443	35,221	31,491	6,850	9,405	472,612	411,031
Other	196,381	56,645	66,900	70,067	124,476	25,345	539,814	456,951
Salaries	400,067	782,726	796,057	655,156	409,209	492,898	3,536,113	2,975,828
Supplies	48,242	73,654	134,696	76,845	47,265	119,293	499,995	396,230
Technical services	57,442	77,656	62,566	131,291	40,256	23,348	392,559	367,483
Travel & vehicle operations	20,263	26,577	55,373	57,715	45,755	22,572	228,255	193,831
	$897,870	$1,316,560	$1,225,124	$1,072,925	$708,686	$741,925	$5,963,090	$5,108,914

Schedule 2

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EQUITY IN FIXED ASSETS

Year Ended March 31, 1980
(with comparative figures for the 1979 year)

	1980	1979
Equity in fixed assets, beginning of year	$2,220,280	$1,905,078
Add: Fixed assets additions (Schedule 1)	472,612	411,031
	2,692,892	2,316,109
Deduct: Fixed asset disposals		
— written off (Note 1)	124,893	86,226
— sold	5,654	9,603
Equity in fixed assets, end of year	$2,562,345	$2,220,280

(See accompanying notes to the financial statements)

Statement 2

SASKATCHEWAN RESEARCH COUNCIL FUND

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— sold	5,654	9,603
Equity in fixed assets, end of year	$2,562,345	$2,220,280

(See accompanying notes to the financial statements)

NOTES TO FINANCIAL STATEMENTS

March 31, 1980

1. **Accounting Policies**

   (a) Fixed Assets

   (i) The Saskatchewan Research Council utilizes fund accounting wherein all receipts and expenditures including those for fixed assets appear in the statement of revenue and expenditure. To maintain accountability for fixed assets, it is necessary to record them as a balance sheet asset with a corresponding entry to "Equity in Fixed Assets". Because asset purchases and sales appear in the statement of revenue and expenditure, no provision has been made for depreciation of fixed assets.

   (ii) The Council's policy is to remove the cost of all equipment from the accounts which have:

   — become obsolete during the year
   — been sold during the year
   — been in service for ten years

   (b) Principles of Consolidation

   The Council's subsidiary does not follow fund accounting practices adhered to by the Council. As a result of the incompatibility of accounting practices the accounts of the subsidiary are not consolidated with those of the Council but are accounted for by the equity method.

2. **Unfunded Liability**

   An actuarial valuation of the pension plan of the employees of the Saskatchewan Research Council as at December 31, 1977 revealed an unfunded liability of $1,105,418 and an experience deficiency of $211,780. Subsequent to the release of this valuation, the Council and the employees covered by the plan approved a change in the benefits payable under the plan retroactive to January 1, 1978. As the result of the changes in the benefits payable, there is no longer an experience deficiency and the unfunded liability as at December 31, 1977 is $403,559. These past service costs are being funded over a period of fifteen years at an annual rate determined by the actuary to be $42,532 which commenced in 1979. An initial unfunded liability of $88,613 for past service costs at the outset of the plan as at May 1, 1974 is being funded at a rate of $8,861 over a fifteen year period which commenced in 1975. The Council feels that these are reasonable periods over which to charge these costs to operations.

3. **Investment in Subsidiary**

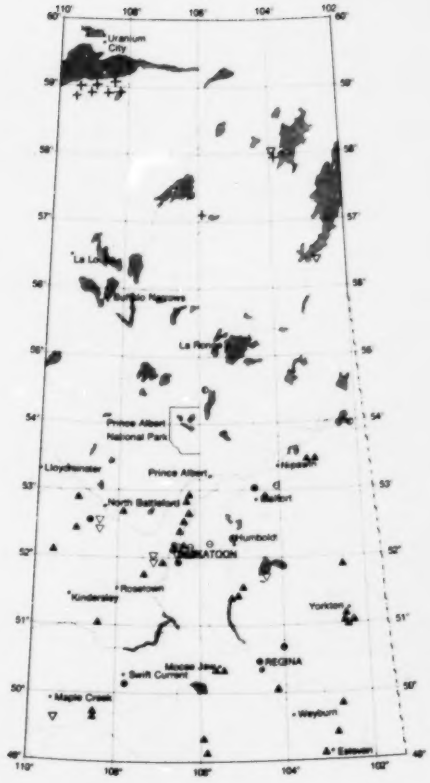
   The Council's subsidiary has been continued under the Business Corporations Act of Saskatchewan on December 18, 1979. It has been inactive since its incorporation.

4. **Commitments**

   At March 31, 1980 the Council was committed to the purchase of equipment in the amount of $748,000.

   For the purchase of certain of the equipment noted above, the council has entered into a conditional sales contract in the amount of $401,305. The contract is payable by a down payment of $51,305 on July 1, 1980, and four annual installments of $115,232 including interest charged at 12% commencing July 1, 1981.

LOCATION OF SASKATCHEWAN RESEARCH COUNCIL FACILITIES



EXPLANATION

- ▲ Observation well
- ⊕ Sewage treatment
- • Pesticide sampling site
- ○ Spray freezing site
- • Slough study
- + Sand dune studies
- ▽ Watershed